

Appendix 3-A

**POTENTIAL ELEMENTS OF A COMPREHENSIVE
STORMWATER MANAGEMENT PROGRAM**

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3-A.1.0 INTRODUCTION

The various program activities that will be included in a local program will vary according to the goals, requirements and resources of the locality in question. The following is a description of elements that should be considered when developing a comprehensive local program.

3-A.1.1 Stormwater Management System Information/Inventory

Information needs are critical to a successful local program. The development of an inventory of the stormwater system is one of the first steps in developing a comprehensive stormwater management program. Relevant information includes the location and classification of storm drains; drainage networks; structural stormwater control facilities; streams, ponds and wetlands; industrial discharges and combined sewer outfalls; watershed boundaries; floodplains; existing and proposed land use and zoning; and known water quality problem areas (especially impaired waters subject to TMDLs). This information can be collected and stored on paper maps or, ideally, in an integrated municipal GIS system. Stormwater system inventories and geographic information tools are covered in more depth in **Appendix 3-B** of this chapter.

3-A.1.2 Watershed-Based Planning

Stormwater master planning and watershed planning help to establish priorities for stormwater management decision-making and should be incorporated early into an effective local program. Watershed-based planning is a tool which allows a locality to assess current and future stormwater problems as well as potential solutions within a drainage basin. It can be used to assess the health of existing water resources and make informed land use, transportation, green space and other local decisions based upon current and projected land use and development within a watershed and its associated subwatersheds. Watershed plans assist communities in developing and evaluating stormwater management scenarios and alternatives.

Watershed and stormwater master plans can be used to identify drainage system and stream segments in need of channel improvement or restoration, and potential locations for regional stormwater control facilities. Watershed planning can also provide a locality with the necessary information for conserving natural areas and open space as well as the development of riparian buffers and greenways. In addition, they may also promote a wide range of additional goals, including water supply protection, wetland protection and preservation, stream bank and stream corridor restoration, habitat protection, protection of historical and cultural resources, enhancement of recreational opportunities, and aesthetic and quality of life issues.

In addition to providing better opportunities for managing stormwater problems and watershed resources, the watershed planning approach also involves stakeholder input and establishes local consensus in the land use and stormwater management decision-making process. Further, watershed plans promise a reduction in the overall capital and operation and maintenance costs for stormwater management from reduced downstream flooding and optimal siting and sizing of stormwater control measures. This potentially includes opportunities for more flexible compliance with local requirements, including options such as local fee-in-lieu, off-site mitigation, and nutrient trading programs. Other benefits include contributions to local land use plans, more sustainable

development, and increased equity and opportunities for developers. The process of watershed plan development and implementation of watershed plans are discussed in more detail in Chapter 5.

3-A.1.3 Development Requirements

Adoption of a comprehensive and integrated set of stormwater management requirements for all new development and redevelopment is critical to addressing the problems of post-construction urban stormwater runoff and is required for NPDES/VPDES municipal stormwater programs. These requirements must be built into a locality's land development code and supported by an effective plan review process. The VSMP permit regulations (9 VAC 25-870-10 et seq.) and this Handbook provide performance requirements and recommended environmental site design practices (**Chapter 6** of this Handbook), and tools and methods (**Chapters 10-13** of this Handbook). Additional guidance can be found on the DEQ stormwater management web page at:

<http://www.deq.virginia.gov/Programs/Water/StormwaterManagement.aspx>

Also see the BMP design specifications (DEQ Stormwater BMP Clearinghouse web site, at <http://www.vwrrc.vt.edu/swc/>) and other guidance that can constitute the standards for new development and redevelopment upon which local ordinances can be based.

3-A.1.4 Design Criteria, Guidance and Training

In support of local development standards and requirements, a community must provide supporting guidance and technical criteria for the design, construction and maintenance of stormwater management facilities. For many communities in Virginia, the inclusion of water quality provisions into stormwater management activities represents a new approach to “traditional” drainage responsibilities. Practitioners who work in the land development (i.e., site designers and engineers) also must face a host of new concepts and ideas that alter their “traditional” approach to managing stormwater on development sites. Therefore, it is important that adequate design assistance, guidance and training be provided to those being regulated by the local stormwater management program.

A formal set of design criteria and specifications for structural control and drainage system design is critical to ensuring that local requirements and goals are met. Communities can adopt this Handbook and the BMP design criteria on the BMP Clearinghouse as the primary design criteria and guidance for developers and design consultants. These criteria are designed to support the minimum stormwater management standards in the regulations and include information and criteria regarding stormwater site plan preparation, environmental site design, recommended hydrologic and hydraulic methods, BMP selection and design, and inspection and maintenance provisions. A locality may wish to prepare an addendum that contains any local criteria (such as specific TMDL requirements) and/or additional reference material. Additional design aids (e.g., karst or coastal area guidance) may be necessary, depending on the locality's needs and requirements.

Training on the design, construction, inspection and maintenance of stormwater management facilities and controls is an essential part of providing technical guidance to developers, engineers and contractors. Regular education programs are important to assure that individuals remain current in the latest requirements and design criteria. They also provide opportunities to train the large influx of new personnel each year in the design, engineering and construction industries, as well as local site plan review and inspection staff. Education programs help all parties to understand their roles and responsibilities, which is essential to effective program implementation. The Department provides training and directs stakeholders to other relevant educational and certification resources (e.g., private sector, institutional and NGO seminars, workshops and conferences).

3-A.1.5 Floodplain Management

Floodplain management involves the designation of flood-prone areas and the limiting of their uses to those compatible with a given degree of risk. It is also aimed at minimizing modifications to streams, reducing flood hazards and protecting the water quality of streams. As such, floodplain management can be seen as a subset of the larger consideration of surface water and stormwater management within a locality. Though it is regulated independent of the SWM program in Virginia and is often considered separately in most communities, there are many areas in which floodplain management directly overlaps with other areas of stormwater management. The development of riparian buffers and greenway corridors along streams and rivers can also preserve floodplain areas and protect their function in safely conveying floodwaters. Floodplain regulations and development restrictions, particularly when based upon the full build-out 100-year floodplain, can greatly reduce future flooding impacts and may allow communities to waive stormwater quantity control (i.e., detention requirements) for larger storm events in some areas.

Ideally, flooding and floodplains should be managed at the watershed level, and floodplain management should be an important goal of comprehensive watershed plans. Consequently, floodplain management activities should be fully integrated into comprehensive stormwater management programs and handled in a complementary and coordinated approach. More information on requirements, strategies and tools for improved local floodplain management are provided by the Virginia Department of Conservation and Recreation's Division of Dam Safety and Floodplain Management, which can be accessed online at:

http://www.dcr.virginia.gov/dam_safety_and_floodplains/index.shtml .

3-A.1.6 Erosion and Sediment Control

Sediment loadings to receiving water are highest during the construction phase of development. Consequently, erosion and sediment control on construction sites is an important element of a comprehensive stormwater management program for water quality and habitat protection. A combination of clearing restrictions, erosion prevention, and sediment controls, coupled with a diligent plan review and strict construction enforcement are needed to help mitigate potential impacts. Indeed, these elements are the focus of the Virginia Erosion and Sediment Control Regulations (9 VAC 25-870-10 et seq.) and Handbook and the USEPA's/Virginia's VSMP General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-870-1170

et seq.). Every locality in the Commonwealth is subject to these requirements, as administered by local governments.

Guidance on BMPs for construction site erosion and sediment control can be found in the *Virginia Erosion and Sediment Control Handbook, Third Edition* (1992). In addition, a number of environmental site design practices discussed in **Chapter 6** can reduce the total amount of area that is cleared and graded. It is essential that erosion and sediment control be considered in stormwater concept plans and implemented throughout the construction phase to prevent damage to natural stormwater drainage systems and post-construction stormwater control measures and conveyance facilities.

3-A.1.7 Local Ordinances

Local ordinances are a key implementation mechanism for many stormwater program objectives. They can include provisions for stormwater management requirements for development, protection of natural areas, erosion and sediment control, the prohibition of non-stormwater discharges to municipal storm sewers, and nonpoint source pollution control. **Table 3-A.1** outlines some types of local ordinances used to support stormwater management activities.

Table 3-A.1. Types of Local Ordinances Used to Support Stormwater Management Activities

Ordinance	How It Addresses Stormwater
Zoning Ordinance	Specifies land uses and site plan minimums that support stormwater management through the use of buffers, setbacks, densities, open spaces, dedications, etc. May also contain the FEMA floodplain regulations implementing the National Flood Insurance Program.
Subdivision Ordinance	Specifies the proper design, permitting and inspection procedures for the subdivision of land for the purpose of development. May contain performance standards similar to a Stormwater Ordinance.
Erosion and Sediment Control Ordinance	Specifies requirements for preventing soil erosion, trapping sediment and protecting receiving waters from sediment and runoff discharge damage during construction activities. Also typically sets forth the procedures to follow for obtaining approval for construction.
Stormwater Management Ordinance	Typically contains comprehensive performance criteria for all components of the stormwater management system along with procedures for obtaining approval for construction.

In Virginia communities, the stormwater requirements are typically scattered among the above ordinances rather than being consolidated into a single comprehensive ordinance. Therefore, it is helpful for the locality to develop a special informational publication that can conveniently and clearly communicate to a developer where the various applicable requirements are found and how they are tied together to achieve the locality's regulatory purposes in the development process. This will help to ensure that all stormwater requirements are met, regardless of the source of authority.

Virginia local governments also have an important policy document that can and should relate to stormwater management. This is the Comprehensive Plan for managing land use (these may have different names from one jurisdiction to another). The comprehensive plan establishes the long range vision for land development, economic growth and quality of life in a locality, and it typically includes goals, objectives and policies for achieving that vision. Ideally, local ordinances should be connected to the comprehensive plan such that their requirements are established to actually achieve the aims of the comprehensive plan. Virginia law does not require this, but localities are free to strengthen the connection between the plan and ordinances, if they choose.

In order to implement a truly effective stormwater management program, localities should consider reviewing and evaluating all the rules, ordinances and policies that may affect implementation of stormwater management, to (1) assure that these documents enable developers to use the best practices and (2) assure that any internal conflicts among the documents are eliminated in favor of encouraging or requiring use of the best development principles and practices. **Appendix C** of this chapter discusses the use of Code and Ordinance Worksheets to conduct such an evaluation. This Appendix also provides two example Worksheets for local use.

3-A.1.8 Plan Review

Having an effective local review process for stormwater management plans (including erosion and sediment control plans) for development is a key element in the successful implementation of stormwater management objectives. The review should be comprehensive, considering all of the potential impacts of a development project. This is an element of the local program where appropriate training of staff is very important. Plan review staff members need to understand the rudiments of drainage engineering and BMP design in order to be able to critically review site plans typically submitted by licensed professionals and to recognize when design choices are beneficial or risky.

The project review and approval process should be clearly explained and readily understandable to the those in the development industry, including all submittal and permit requirements. **Section 3.4** of Chapter 3 discusses Virginia requirements for the plan review process in more detail.

3-A.1.9 Site Inspection and Enforcement

A locality needs to provide the means for the enforcement of established ordinances and permit requirements. Trained personnel are required to inspect and ensure compliance for erosion and sediment control, stormwater management plans, removal of illicit connections, and private maintenance of structural stormwater controls. **Sections 3.7 and 3.8** below discuss Virginia requirements for inspection and enforcement in more detail. More specific guidance for establishing an inspection/maintenance element of the local program can be found in **Chapter 9** of this Handbook.

3-A.1.10 Stormwater System Improvements

There are several ways that a local government can make physical improvements to the stormwater management system. These can include capital improvements, such as the design and construction of conveyance structures or regional controls, stream stabilization and restoration programs, and the acquisition of floodplain areas and natural areas, such as buffers and wetlands. It is important for older communities to keep aging drainage infrastructure in mind and have, as part of its capital improvement budget, a methodical plan for repairing and replacing it in a manner that causes minimal displacement or inconvenience for local citizens.

3-A.1.11 Long-Term Operation and Maintenance

An essential component of a comprehensive stormwater management program is the on-going operation and maintenance of the various components of the stormwater drainage, control, and conveyance systems. Failure to provide effective maintenance can reduce the hydraulic capacity and the pollutant removal efficiency of stormwater controls and conveyance systems.

Operation and maintenance activities can include cleaning and maintenance of catch basins, drainage swales, open channels, storm sewer pipes, stormwater ponds, and other stormwater control measures. Street sweeping and other pollution reduction activities also fall under operation and maintenance. Ideally, the best program addresses operation and maintenance concerns proactively, rather than reacting to problems such as flooding, stream channel erosion or water quality degradation after they occur.

A clear assignment of stormwater inspection and maintenance responsibilities is essential to ensuring that the system continues to function as it was intended. This is true whether inspection and maintenance are accomplished by the local government, land owners, private concerns, or a combination of these approaches. Maintenance requirements are an important consideration in the selection and design of BMPs. Therefore, site designers should strive to make their systems accessible and as simple and maintenance-free as possible.

Stormwater system operation and maintenance can also include retrofitting existing development to meet water quality and/or water quantity goals and restoring the bed, banks and profiles of degraded streams. **Section 3.9** below discusses Virginia requirements for SWM facility maintenance in more detail.

3-A.1.12 Monitoring

Regular monitoring data can alert the local program about failures in the system and assist local staff in making sound management decisions and provide support for enforcement actions. Typical monitoring data include water quality and streamflow measurements, as well as stream stability and habitat assessments. The monitoring program can be designed to address specific issues or problems within individual watersheds. Short-term monitoring can be used to evaluate the performance of implemented solutions. Long-term data collection can be used to identify trends. Some TMDL implementation plans call for monitoring to determine if controls are working, and new USEPA effluent limitation criteria for construction sites will necessitate monitoring by some developers (typically, very large projects).

3-A.1.13 Pollution Prevention

Also known as *source controls*, pollution prevention management practices are an important way to reduce or prevent water quality problems in stormwater runoff from a variety of sources. The intent of source control practices is to prevent stormwater from coming in contact with pollutants in the first place, rather than having to provide more structural controls for treatment and pollutant removal. Pollution prevention programs are required in communities subject to MS4 permits, but source control programs are a good idea whether or not they are required by law. Pollution prevention includes categories of measures such as the following:

- Materials management (storage, use, exposure, and disposal/recycling controls)
- Spill prevention and cleanup
- Removal of illicit connections to storm sewers
- Prevention of illegal dumping
- Street and storm drain cleaning and maintenance
- Public information and education

Examples of source control practices include covering stockpiles of soil, mulch, and road deicing chemicals to prevent erosion and exposure to runoff; safe hazardous waste storage; dry weather screening of stormwater outfalls to detect illicit connections; storm drain stenciling; street sweeping; fertilizer use restrictions; leaf collection programs; and efforts to educate and influence citizen behaviors (e.g., proper motor oil disposal and household hazardous waste management). All of these activities impact stormwater runoff quality.

Many of these practices are easily implemented and are cost-effective means of reducing stormwater contaminants. As such, they should be considered, where appropriate, for all residential, commercial, industrial, institutional, and municipal projects and activities. In addition, many are required activities for MS4 permit programs. Additional information regarding pollution prevention is provided in **Chapters 5 and 8** of this Handbook.

3-A.1.14 Public Education and Involvement

In order to gain public support for local stormwater management programs, citizens and the business community alike need to be educated and involved in the process. General education efforts can provide information about stormwater issues and pollution prevention practices. Educational efforts include the following:

- Meetings and presentations
- Newsletters, fact sheets and brochures, both in hard copy and on the locality's web site
- Homeowner educational materials (realtors can help to distribute such material)
- Media campaigns
- Coordination with citizen groups for program support

In addition, programs such as Adopt-A-Stream and the Save-Our-Streams citizen monitoring program can involve local citizens in the cleanup and monitoring of local streams. The public can also be involved in the development of watershed plans and overall stormwater management

policy. More information on stormwater public information and education programs is provided in **Chapter 5** of this Handbook.

3-A.1.15 Funding

Adequate funding of local stormwater management program activities is perhaps one of the most critical and yet most difficult aspects of establishing an effective, comprehensive program. The best-designed stormwater management program is likely to founder without sufficient local support and a stable and sufficient funding source. An effective and on-going program includes planning, engineering, plan review, capital improvements, inspections, maintenance, and enforcement activities. This will often require more resources than what is typically available from general appropriations, which is the funding source used by most local governments in Virginia to fund drainage and stormwater infrastructure activities.

Local citizens often take stormwater management for granted, because the water typically runs through underground pipes that are out of sight and, therefore, out of mind. However, when individuals suffer the consequences of poorly planned or maintained control measures (flooding, enlarged stream channels, pervasive sediment damage, etc.), stormwater leaps into focus. It is important to design projects and manage the system so that no citizen has to suffer such consequences.

Therefore, ensuring sufficient program funding is an effort worthy of an effective public education and stakeholder involvement campaign. Local citizens should understand the importance of managing runoff effectively and the potential consequences of not doing so. Public education can help citizens to view stormwater management as a *service* to them, in the same way that providing and maintaining their local roads is a governmental service that has a cost attached. The next section provides an overview of various approaches that a locality can take to establish a dedicated funding source, including the creation of a stormwater utility.